

CLAIMS

1. A composite component having a negative effective Poisson's ratio, the composite component including a first component and a second component, the first component and the second component extending longitudinally relative to an axis, the first component being provided around the second component through one or more turns, the one or more turns being spaced longitudinally relative to the axis, variation in the tensile load on the first component causing the radial position of the second component relative to the axis to vary.
2. A composite component, preferably according to claim 1, having a negative effective Poisson's ratio, the composite component including a first component and a second component, the first component and second component extending longitudinally relative to an axis, the first component being provided around the second component through one or more turns, the first component having a higher modulus of elasticity than the second component, variation in the tensile or compressive load on the first component causing the radial position of the second component relative to the axis to vary.
3. A composite component, preferably according to claim 1 or claim 2 having a negative effective Poisson's ratio, the composite component including a first component and a second component, the first component and the second component extending longitudinally relative to an axis, the first component being provided around the second component in a helical manner, variation in the tensile or compressive load on the first component causing variation in the diameter of the helix the first component follows, the variation in the diameter of the helix of the first component causing the second component to take on the form of a helix and/or causing the diameter of the helix of the second component to vary, the diameter of the second component helix increasing as the first component helix decreases in diameter, the diameter of the second component helix decreasing as the first component helix increases in diameter.

4. A composite component according to any preceding claim in which the first component is provided around the second component by applying and/or wrapping and/or covering and/or spinning.
5. A composite component according to any preceding claim in which the first component is a fibre, rod or hollow tube of a relatively high modulus material and the second component is a fibre, rod or hollow tube of an intermediate or a low modulus material compared with the first component material.
6. A composite component according to any preceding claim in which the axis is provided through a core component.
7. A composite component according to any preceding claim in which the variation in radial position is an increase in the displacement of at least a part of the second component relative to the axis when the load is varied, with the variation being an increase when the load is a tensile load and a decrease when the load is a compressive load.
8. A composite component according to any preceding claim in which the variation in radial position is a decrease in the displacement of at least a part of the second component from the axis when the load is varied, with the variation being a decrease when the load is a tensile load and an increase when the load is a compressive load.
9. A structure comprising two or more composite components provided according to any of claims 1 to 8.
10. A structure according to claim 9 in which the structure includes at least a pair of composite components, each composite component including a first component and a second component, the pair of composite components being arranged adjacent to one another or in contact with one another.

11. A structure according to claim 9 or claim 10 in which the structure is formed from repeats of a unit comprising multiple composite components.
12. A structure according to any of claims 9 to 11 in which the structure is provided by each composite component being provided adjacent to or in contact with two or more other composite components, so as to form a planar or sheet type structure.
13. A structure according to any of claims 9 to 11 in which the structure is provided by each composite component being provided adjacent to or in contact with four or more other composite components.
14. A structure according to any of claims 9 to 13 in which adjacent composite components are provided with first components that are wrapped around the second component in opposite directions to one another.
15. A structure according to any of claims 9 to 14 in which the structure is provided with one or more core components.
16. A structure according to claim 15 in which the core component is a fibre and/or is solid or hollow.
17. A structure according to claim 15 or 16 in which all three components are provided so that there is limited movement or no movement of the components over each other.
18. A structure according to any of claims 9 to 17 in which the structure includes one or more matrix components.
19. A structure according to claim 18 in which the matrix component resists the movement of the second component caused by load variation and/or encourages the return of the second component to the radial position it occupied prior to load variation.

20. A structure according to any of claims 9 to 19 in which the structure is energy absorbing, for instance impact absorbing and/or acoustic absorbing.
21. A method for producing a composite component having a negative effective Poisson's ratio, the method comprising forming a first component; forming a second component; applying, for instance by wrapping and/or spinning and/or covering, the first component around the second component through one or more turns, the one or more turns being spaced longitudinally along the second component.
22. A method, preferably according to claim 21, for producing a composite component having a negative effective Poisson's ratio, the method comprising forming a first component; forming a second component; applying, for instance by wrapping and/or spinning and/or covering, the first component around the second component through one or more turns, the modulus of elasticity of the first component being greater than the modulus of elasticity of the second component.
23. A method, preferably according to claim 21 or claim 22, for producing a composite component having a negative effective Poisson's ratio, the method including forming a first component; forming a second component; the first component and the second component extending longitudinally relative to an axis; applying the first component around the second component in a helical manner, for instance by wrapping and/or spinning and/or covering, variation in the tensile or compressive load on the first component causing variation in the diameter of the helix the first component follows, the variation in the diameter of the helix of the first component causing the second component to take on the form of a helix and/or causing the diameter of the helix of the second component to vary, the diameter of the second component helix increasing as the first component helix decreases in diameter, the diameter of the second component helix decreasing as the first component helix increases in diameter.

AMENDED CLAIMS

[received by the International Bureau on 24 August 2004 (24.08.04);
original claims 2-3, 22-23 amended; remaining claims unchanged (2 pages)]

1. A composite component having a negative effective Poisson's ratio, the composite component including a first component and a second component, the first component and the second component extending longitudinally relative to an axis, the first component being provided around the second component through one or more turns, the one or more turns being spaced longitudinally relative to the axis, variation in the tensile or compressive load on the first component causing the radial position of the second component relative to the axis to vary.
2. A composite component according to claim 1, in which the first component has a higher modulus of elasticity than the second component.
3. A composite component according to claim 1 or claim 2 having the first component provided around the second component in a helical manner, variation in the tensile or compressive load on the first component causing variation in the diameter of the helix the first component follows, the variation in the diameter of the helix of the first component causing the second component to take on the form of a helix and/or causing the diameter of the helix of the second component to vary, the diameter of the second component helix increasing as the first component helix decreases in diameter, the diameter of the second component helix decreasing as the first component helix increases in diameter.

20. A structure according to any of claims 9 to 19 in which the structure is energy absorbing, for instance impact absorbing and/or acoustic absorbing.
21. A method for producing a composite component having a negative effective Poisson's ratio, the method comprising forming a first component; forming a second component; applying, for instance by wrapping and/or spinning and/or covering, the first component around the second component through one or more turns, the one or more turns being spaced longitudinally along the second component.
22. A method according to claim 21, in which the modulus of elasticity of the first component is greater than the modulus of elasticity of the second component.
23. A method according to claim 21 or claim 22, including applying the first component around the second component in a helical manner, variation in the tensile or compressive load on the first component causing variation in the diameter of the helix the first component follows, the variation in the diameter of the helix of the first component causing the second component to take on the form of a helix and/or causing the diameter of the helix of the second component to vary, the diameter of the second component helix increasing as the first component helix decreases in diameter, the diameter of the second component helix decreasing as the first component helix increases in diameter.